

Introduction to the Surgery of the Gall-Bladder

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MATERIAL, 1935-1942 INCLUSIVE.

Cholecystectomy—

With Stones	-	-	-	116
Stoneless	-	-	-	34
			—	150
Cholecystostomy	-	-	-	13
Common Duct Stone	-	-	-	5
Cholecyst-Duodenostomy	-	-	-	2
Cholecyst-Gastrostomy	-	-	-	2
			—	
TOTAL Gall-Bladder Operations			-	172
Operation Mortality				5 (2.9%).

HISTORY.

WHILST history records the existence of gall-stones and diseases of the gall-bladder for some thousands of years, the first surgical attack on this organ is of comparatively recent date. As far as I am aware, the first surgeon to open and drain the gall-bladder was Sims in 1878. Lawson Tait, referring to this first cholecystostomy, made the following rash statement: "The entire possibilities of treatment of gall-stones and distended gall-bladder are exhausted by Sims' paper." The first cholecystectomy was performed by Langenbuch in 1882, and it was twenty-nine years before a Belfast surgeon followed suit.

In March, 1909, Fullerton and Kirk removed gall-bladders, and they were closely followed by Robert Campbell in April. It almost looks as if Fullerton had stimulated Kirk and Campbell. There is no doubt about the Kirk operation, as the notes clearly state that the cystic duct was ligatured with linen thread, the duct divided, and the gall-bladder, containing stones, removed. The notes on Fullerton's case are not so clear, as they state that the cystic duct was cut across and a stone removed from the cystic duct, but they fail to mention that the gall-bladder was removed.

As operative mortality was gradually reduced, surgeons became bolder, and many battles have been fought over "removal v. drainage," with the result that at the present time one feels that there is a proper field for each operation. More recently there has been much discussion over the stoneless gall-bladder, and much adverse criticism of the high proportion of stoneless gall-bladders in some cholecystectomy lists. Where this figure reaches thirty to forty per cent. it is felt that the gall-bladder has been unnecessarily sacrificed. At the present moment the main point at issue is when to explore the common duct.

ANATOMY.

Whereas the anatomy of the normal gall-bladder is comparatively simple, the

pathological anatomy is most varied and complicated. Reference to a text-book of anatomy gives a good description of the normal, but where will you obtain a description of the gross pathological changes? Only the surgeon has the opportunity to record the varying conditions, and he rarely has the ability or inclination. Let me give a few examples of confused anatomical terminology.

"The cystic duct is never ligatured until it has been traced *upwards* into the neck of the gall-bladder."

One writer compares the relationship of Hartman's pouch to the cystic duct as that of the cæcum to the terminal ileum, or, in other words, he places the pouch lateral to the cystic duct, whilst Hartman figures his pouch medial to the cystic duct.

Another surgeon introduces the term pelvis in place of Hartman's pouch. Much of this confusion is probably due to the surgeon describing the gall-bladder as he may see it at operation, in the inverted position. The body and its contents should be described in the erect position, and the terms medial, lateral, anterior, posterior, superior, and inferior used.

As a result of obstruction, the gall-bladder may increase enormously in size, and a pouch of miniature size in the normal may undergo considerable dilatation. Such pouches are found in the region of the neck, and may be found medial, anterior, or lateral to the cystic duct. They lead to difficulty in defining the cystic duct.

Marked variations in the cystic duct may be found at operation :

1. The normal text-book type—A $1\frac{1}{2}$ -inch duct passing upwards, backwards, and medially to join the common duct. In its lower or gall-bladder half its lumen is obstructed by the spiral valve, a valve which frequently holds up small stones.
2. The short straight wide cystic duct, which easily transmits stones into the common bile duct. In this variety the spiral valve may be absent.
3. The S-shaped cystic duct or the kinked duct, with the kinks maintained by peritoneal attachments.
4. Close adhesion of the cystic duct to Hartman's pouch.

ASCERTAINMENT.

The two outstanding fingerposts guiding the patient to the surgical ward are biliary colic and "a positive X-ray," and without these the large majority of gall-stones would be missed. Rare signs may be present, such as tenderness over the gall-bladder, a palpable gall-bladder, varying degrees of jaundice and dyspepsia. The radiogram may show stones in the clear picture, and after cholepulis there may be absence of a gall-bladder shadow or filling defects in the shadow. The typical gall-stone shadow is faceted, has a clear centre and an opaque cortex, but others show a uniform opacity.

"LIVING PATHOLOGY."

Having opened the abdomen in the expectation of finding a surgical gall-bladder, the surgeon may encounter one of the following conditions—

- (a) The liver is diseased and the gall-bladder is normal. Commonly the disease

takes the form of cirrhosis, but there may be secondary tumours or hydatid cyst.

- (b) The gall-bladder is normal, and the symptoms are due to gastric ulcer, duodenal ulcer, or a chronic appendix.
- (c) The stoneless pathological gall-bladder. The changes may appear as thickening of the wall, distension, a change from the normal sea-green to white, deposit of fat, adhesions.
- (d) Gall-stones in the gall-bladder or cystic duct.
- (e) Gall-stones in the gall-bladder with pus or bile.
- (f) Distension of the gall-bladder and common duct due to a tumour of the head of the pancreas or of the ampulla of Vater.
- (g) Common duct stone.
- (h) Gall-stones associated with perivesicular abscess.
- (i) Gall-stones with a fistula into the duodenum or colon.
- (j) Carcinoma of the gall-bladder.

COMPLICATIONS.

Jaundice.

- (a) The jaundice may be due to some liver condition, such as cirrhosis or malignant disease, and be unsuitable for surgical interference.
- (b) A slight degree of jaundice may accompany gall-stones limited to the gall-bladder or cystic duct, with no visible or palpable pathology of the common duct. The jaundice is probably due to a hepatitis, and cholecystectomy is indicated.
- (c) The jaundice may be due to obstruction of the common duct by a stone. The supra-pancreatic portion of the duct will be visibly dilated and the stone may be palpable somewhere along the common duct. There will probably be stones in the gall-bladder. The essential point is the relief of the common duct obstruction by removal of the stone. Stones should be removed from the gall-bladder and the gall-bladder drained, if patient is well enough.
- (d) The jaundice may be due to obstruction of the common duct by a tumour of the head of the pancreas or by a carcinoma of the ampulla of Vater. Here one will be limited to some palliative operation, such as an anastomosis between the gall-bladder and the stomach or between the gall-bladder and the second part of the duodenum. In one case in this series obstruction of the ampulla of Vater was relieved by removal of a pedunculated adeno-carcinoma attached to the region of the ampulla. The patient was free from symptoms for three years, and then died of pneumonia.

External fistula.

Gall-stones, mucus, or bile may escape from the fistula, and there may have been a previous operation.

If stones are being discharged the gall-bladder should be explored, any stones present removed and the gall-bladder removed or drained, according to the conditions found.

A mucus fistula will be due to an obstructed cystic duct. The obstruction will usually be due to a stone in the duct, in Hartman's pouch or in the neck of the gall-bladder. The fistula will be cured by cholecystectomy.

Biliary fistula is usually post-operative, and is due to an unrelieved obstruction of the common duct or to an injury to the common duct. There are three probable explanations of the fistula—

- (a) The fistula leads into the gall-bladder and there is a stone impacted in the common duct. The fistula will be cured by removal of the common duct stone.
- (b) The fistula leads into the gall-bladder, and there is an obstruction of the common duct by a tumour of the head of the pancreas or by a carcinoma of the ampulla of Vater. The external fistula will be cured and the condition temporarily improved by a cholecyst-gastrostomy or a cholecyst-duodenostomy.
- (c) The gall-bladder has been removed and the fistula leads into the common duct or common hepatic duct. Here it may be possible to reconstruct the common duct and close the fistula.

The acute gall-bladder.

This is one of the most difficult problems in gall-bladder surgery. Are we to allow our gall-bladders to settle down before operating, and thus obtain a low operation mortality, or are we to operate early so as to save the occasional perforation? One's own practice is to delay operation for seven to ten days, when the temperature will have settled to normal and the general condition has much improved, but one must be on the look-out for the acute perforation, and operate immediately. Fortunately, acute perforation is rare, but it has similar signs to those of a perforated peptic ulcer or an acute pancreatitis.

Stones impacted outside the biliary track.

The stone usually ulcerates through the wall of the gall-bladder into the second part of the duodenum. It is large, and may obstruct the lower ileum. Instead of entering the duodenum, it may enter the transverse colon, and may be large enough to obstruct the large bowel. Once the stone has escaped into the intestine, the fistula tends to contract down and requires no treatment, but the intestinal obstruction must be relieved.

The stone may escape from the gall-bladder and lie in a cavity between the gall-bladder and duodenum. Here there is a danger of duodenal fistula following operation for removal of the stone.

Secondary operations for recurrent symptoms.

- (a) Where stones have been removed from the gall-bladder and the gall-bladder closed or drained. On September 29, 1942, one operated on a woman whose abdomen had been opened five years previously through a sub-umbilical mid-line incision. Through this incision gall-stones had been removed. A recent cholecystogram showed poor filling of the gall-bladder and a ring-like opacity above the fourth lumbar right transverse process, suggesting gall-stone. For six months she had been having attacks of biliary colic. The second operation,

by a sub-costal incision, revealed an elongated gall-bladder which contained two moderate-sized stones of mixed infection type. The fundus of the gall-bladder was adherent to the gastro-colic ligament. The gall-bladder was removed.

- (b) Biliary colic with jaundice appearing after cholecystectomy. One has encountered this condition on two occasions, and in both cases the symptoms were due to common duct stone. Removal of the stone cured the condition.

REMOVAL OF THE GALL-BLADDER.

This operation was performed for the first time by Langenbuch in 1882, and was first performed in the Royal Hospital, Belfast, in 1909. For many years it was a rare operation, and surgeons contented themselves with a simple opening of the gall-bladder, removal of stones, and external drainage. At the present time, in my own unit it ranks second to appendicectomy in frequency, and I look upon the gall-bladder as the second most important viscus in the abdomen to the general surgeon. With careful selection of cases, suitable pre-operative medication, interference in a quiescent period, and a clear demonstration of the anatomy during operation, one should aim at an operation mortality of two to three per cent. Once the case is complicated by obstruction in the common duct, the mortality becomes much higher, and many of the gall-bladder deaths in our hospital occur in such cases. One is often disappointed in surgical writings by the complete absence of any technical details, but the teaching of our text-books favours :

- Isolation of the cystic duct,
- Division of the cystic duct,
- Ligature of the cystic vessels,
- Separation of the gall-bladder from the liver.

I must admit that I have not practised this method for many years, as I could not be sure of my anatomy until I had thoroughly mobilised the gall-bladder and cystic duct. The alternative method of removing the gall-bladder, and the one which one practises and recommends, is :

- Separation of the gall-bladder from the liver from below upwards;
- Control of the bleeding-points on the gall-bladder wall;
- Ligature and division of the ligaments (including the cystic vessels) attaching the neck of the gall-bladder to the region of the portal fissure. So far this has been an antero-lateral approach.

We now attack the cystic duct from the medial aspect by removing the peritoneum and fat overlying it. Here one may find the cystic lymph-gland or a Hartman's pouch or a Hartman's bassinette. The cystic duct when found should be traced to the common duct. One now returns to the antero-lateral aspect to ligature and divide any ligaments which may still anchor the gall-bladder neck. The cystic duct should now be straight and in full view. It can be palpated for stones and opened for their removal. Ligature of the cystic duct and division distal to the ligature is the last step in removal.

This may be a very easy operation or a very difficult one. A small highly-placed

liver with a small thick-walled gall-bladder surrounded by adhesions are difficulties in the way of anatomical exposition, and one may be forced to remove only the lower part of the gall-bladder by dividing the neck and ligaturing the bleeding-points in the cut edge. This is a safe technique, as one can define the neck by exploring the cavity of the gall-bladder with the finger or probe. The only objection to this modification is that small stones may be left in the cystic duct.

Almost invariably one uses the oblique sub-costal incision. It is easy to make, easy to close, permits drainage through its lateral angle, and shows no tendency to hernia. It also permits exploration of the appendix.

The position of the patient is of great importance, and since using the tilted position one has been able to discard illuminated retractors. The head of the table is raised to an angle of forty-five degrees, whilst a foot-piece and a strap across the knees prevent the patient slipping.

CAUSES OF DEATH AFTER GALL-BLADDER OPERATION.

An investigation into the cause of death in gall-bladder operations in the Royal Hospital, during the seven years 1935 to 1941, was carried out by my resident pupils, Denise Corkey and Margaret Mitchell.

Out of 768 operations there have been 71 deaths. This gives a mortality of 9.2 per cent., a figure closely approximating to global mortality. The following is a list of the outstanding features of the cases :

No reason for death - - -	16	Gall-bladder ruptured during	
Common duct stone		removal - - -	4
(37 per cent. mortality) -	13	Technical difficulties - -	6
Ileus - - - - -	3	Hæmorrhage - - -	4
Fæcal fistula - - -	3	Previous operation on gall-	
Rupture of intestine - -	3	bladder or common duct	3
Impaction of stone in jejunum	1	Lung trouble—	
Subphrenic abscess - -	4	Collapse : - -	1
Cirrhosis of liver - - -	2	Pneumonia - - -	4
Pancreatic tumour - - -	2	Embolus - - -	1— 6
Gangrenous gall-bladder -	3	Uræmia - - - - -	1
		Cardiac - - - - -	1

When one investigates the cause of death in the hospital cases, it is usually only possible to point out some outstanding feature. Many of the cases were not subjected to post-mortem examination, and in some of the cases the notes are incomplete. It is not easy to estimate the resistance of an abdomen to operative interference, and I have found the physician of little value in deciding this problem. So many viscera are concerned in the post-operative course that no one test is likely to be of any value. The heart, the lungs, the liver with its various functions, the kidneys, and general morale are all concerned. Any one of these may give out and lead to defeat.

One notes in this series sixteen cases with no satisfactory explanation of death, and some of these cases might have been left alone safely. What was the hidden weakness which prevented them surviving even sometimes a most trivial operation?

Common duct stone showed a mortality of thirty-seven per cent., a figure closely allied to those of Barrington Ward (thirty-five per cent). Wilkie gave twenty per cent. as a reasonable rate for this condition, but Flint's last series was down to four per cent., as a result of very careful pre-operative treatment and liver function tests.

It is evident that one should limit the surgical technique to the minimum which will relieve the obstructed duct—opening the duct and removing the stone. It is not always easy to find the stone, and one notes that in a case subjected to operation the stone could not be found, but was found, at post-mortem, in the ampulla of Vater. In one of my cases a stone was palpated in the ampulla, could not be found transduodenally, but was found and removed by an anterior approach. Most frequently the stone lies in the accessible suprapancreatic part of the duct, or the stone can be milked from the pancreatic into the suprapancreatic part. In one case the stone had to be manipulated from the hepatic duct into the common bile duct.

Should one drain the duct with a T tube or leave a drain down to the closed incision in the duct? One has tried both methods, and I think that the convalescence is shorter when the duct is closed.

It is remarkable that the very simplest operation on the gall-bladder may result in death, and there may be no explanation for it. In one of the cases the technique consisted merely in dividing a peritoneal band connecting the gall-bladder to the duodenum. In several of the cases the gall-bladder contained no stones, was the seat of chronic inflammation, and its removal presented no technical difficulties. This, I think, is important, as it shows that mere simplification of technique will not prevent the occasional death. Age is an important factor, and some of the deaths were in people over 70.

THE PROBLEMS OF GALL-BLADDER SURGERY IN 1942.

The problem of the stoneless gall-bladder.

The operation has been undertaken for the relief of dyspeptic symptoms or biliary colic, with poor concentration as seen on the radiogram. If one finds definite living pathology, then one should remove the gall-bladder, but there are a number of border-line cases which will give rise to indecision. On the one hand he may remove a gall-bladder without relieving the symptoms, or he may leave a gall-bladder which had it been removed would have cured the patient.

Cholecystostomy v. cholecystectomy.

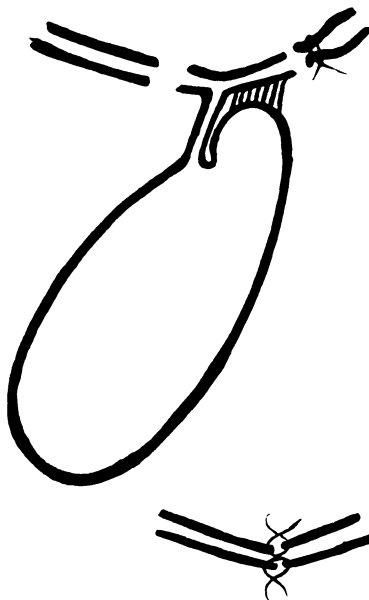
Should one perform a simple and safe operation, and run the risk of reformation of stones, plus the chance of leaving stones in the cystic duct, or aim at a permanent cure with a somewhat higher mortality.

When should one explore the common duct and how determined should one be in this exploratoin?

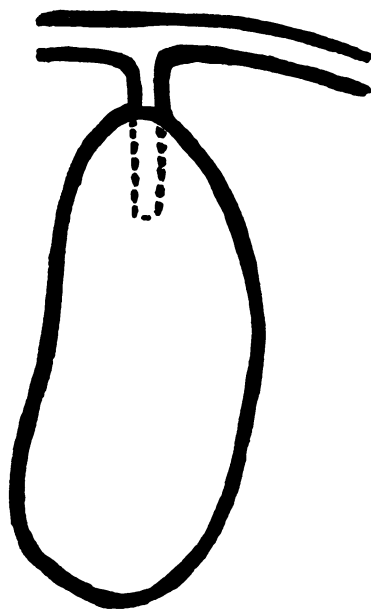
In an article in "British Journal of Surgery" (Mackey, October, 1934) the following statement is made: "The risk of attack upon the gall-bladder has been



1.—Normal gall-bladder and cystic duct. Note the cystic gland medial to the duct, the cystic artery lateral to the duct, the spiral valve in the lower half of the cystic duct, and the small medial bulge of the neck of the gall-bladder (Hartman's bassinette).

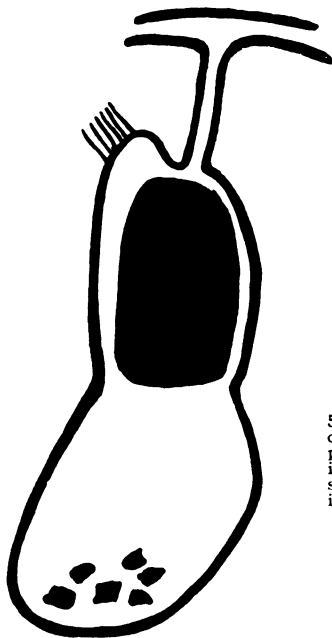
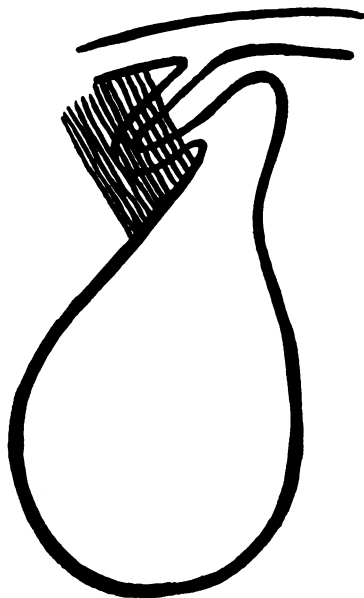


2. A gall-bladder with a Hartman's pouch lying medial to the cystic duct. The pouch is attached to the common bile duct by a peritoneal fold. In removing this gall-bladder the mistake was made of removing the entire cystic duct, plus a portion of common hepatic duct and common bile duct. The small diagram below shows the end-to-end anastomosis between the common hepatic and common bile duct, which was performed successfully three days later. The patient made a good recovery, and the biliary fistula closed rapidly.



3.—A gall-bladder with a Hartman's pouch lying anterior to the cystic duct. This is the gall-bladder from the famous Man 50, whose sections have been used for many years in the Anatomy Department.

4.—Gall-bladder showing a Hartman's pouch medial to the cystic duct and a kink of the cystic duct maintained by ligamentous attachments. The gall-bladder was stoneless, but distended. It was removed.



5.—Gall-bladder showing a pouch lateral to the cystic duct, which was fixed by a ligament to the portal fissure. There was a large stone impacted in the upper part of the gall-bladder and a few stones in the fundus. The large stone was visible in the straight X-ray. After removal of the stones, the gall-bladder was removed.

to a great extent eliminated, and interest has moved away from mortality statistics, bacteriology, and pathology, to be focused upon end-results and theories of gall-bladder function." The figures of this hospital do not justify this statement, as we are still a long way above the par figures of the course. One should aim at a two per cent. mortality for gall-bladder operations uncomplicated by common duct obstruction.

Operation mortality.

Operation mortality depends much upon selection of cases, upon avoidance of the bad case, and upon luck. All the worst cases gravitate towards the surgeon with a reputation, and thus spoil his figures. It is said that Treves only did easy appendices, and left the fifth-day cases to his assistant. The wise old owl knows what to avoid.

The common bile duct.

The common bile duct still remains somewhat a problem to me. I am accustomed to leave alone the common duct which looks normal and feels normal and is not accompanied by jaundice. Still, on two occasions a patient has returned, after cholecystectomy for gall-stones, with a stone in the common duct. This passage of a sound down the common duct into the duodenum may be possible through a short wide cystic duct, but otherwise the common duct must be opened. One surgeon confessed to me that on one occasion he pushed a sound through the wall of the duct into the head of the pancreas, with the result that the patient died. I cannot believe that the single passage of a sound through the bile papilla will permanently relieve obstruction or permanently stretch a sphincter of Oddi. Systematic sounding of the duct may very occasionally disclose an unsuspected stone, but only at the cost of serious disturbance to a number of normal ducts. Better, I think, to perform a second operation when necessary.

THE STONELESS GALL-BLADDER.

The following conclusions by Mackey are of value in this matter.

Removal of a stoneless gall-bladder carries a mortality of three per cent. cure of symptoms results in thirty per cent., improvement in thirty per cent., unsatisfactory in thirty-seven per cent.

The more diseased the gall-bladder the more likely is the outcome to be favourable.

Cholesterosis alone does not produce symptoms and does not justify removal of a gall-bladder.

Microscopic changes are not significant unless they are fairly gross.

REMARKS ON COMMON DUCT STONE.

The longer a patient carries gall-stones, the more frequent is the incidence of common duct stone.

Duration	Incidence of common duct stone		
Under 2 years	-	-	2 per cent.
2-10 years	-	-	9 per cent.
Over 10 years	-	-	11 per cent.

Frequency of common duct exploration.—This varies in surgical lists from seven to twenty per cent.

The frequency of common duct stone has been estimated as eighteen per cent. of all gall-stone cases.

Pre-operative treatment in common duct obstruction.—Delay operation one or two weeks. Water, salt, sugar, and blood are the chief needs; these can be given intravenously as glucose saline and blood transfusion. Calcium gluconate and vitamin K tend to reduce bleeding.

Operation in common duct obstruction.—Anæsthesia: icoral, spinal anæsthesia, and gas and oxygen. Limit the technique to the minimum, and in the most severe cases one should merely drain the common duct and leave the removal of the stone to a later date.

Post-operative.—Ten per cent CO₂ in oxygen during four deep breaths, repeated four times an hour during the first twenty-four hours, diminishes the tendency to lung collapse.

FOLLOW-UP.

I am much indebted to Miss Gough and her assistants for the follow-up of one's gall-bladder operations during the period 1935 to 1939.

The following results were obtained:—Good recovery 38, improved 14, still under treatment 12, dead 8, untraced 30.

Three of the dead were over 70. The untraced may have changed their address or may be dead, but of the seventy-two traced—72 per cent. show a good result, seventeen per cent. a poor result, eleven per cent. dead.

Many of the patients wrote enthusiastic letters as to the benefits of the operation, and several enclosed a one pound note as a subscription to the hospital.

REVIEW

CATECHISM SERIES.—SURGERY (Fifth Edition). Parts I to V. Author not stated. Pp. 376. With X-ray plates. Price: each part 1s. 6d. net. Complete in one vol. 7s. 6d. net. **ANATOMY (Fifth Edition).** Part V (Thorax). By C. R. Whittaker, F.R.C.S.E., F.R.S.E. Pp. 76. Price 1s. 6d. net.

On a famous occasion a student excused his shortcomings in an oral examination by stating that question and answer was not a proper form of conversation amongst gentlemen. One cannot help sympathising with this while reading the booklets under review. There can scarcely be a method of teaching less likely to excite the interest or arouse the intelligence of the average student than the method used here.

However, it is undeniable that a few find a catechism of real value, especially by way of revision. To these few the present series can be recommended. In the Surgery series the range of subject matter is wide, the answers adequate enough for the final examinations, the lists of contents, lay-out, and index well arranged. The reproductions of X-ray plates in parts I and II could, with ease and advantage, have been enlarged to fill the ample space available. One deplores the paucity of diagrams, but perhaps it is the intention of the author to confine himself strictly to the verbal reply.

The booklet on the Thorax is completely lacking in diagrams, but is an excellent anatomical summary of the region. Its last sixteen pages gives a lucid account of the lymphatic system of the whole body.